

# HCI 558 X

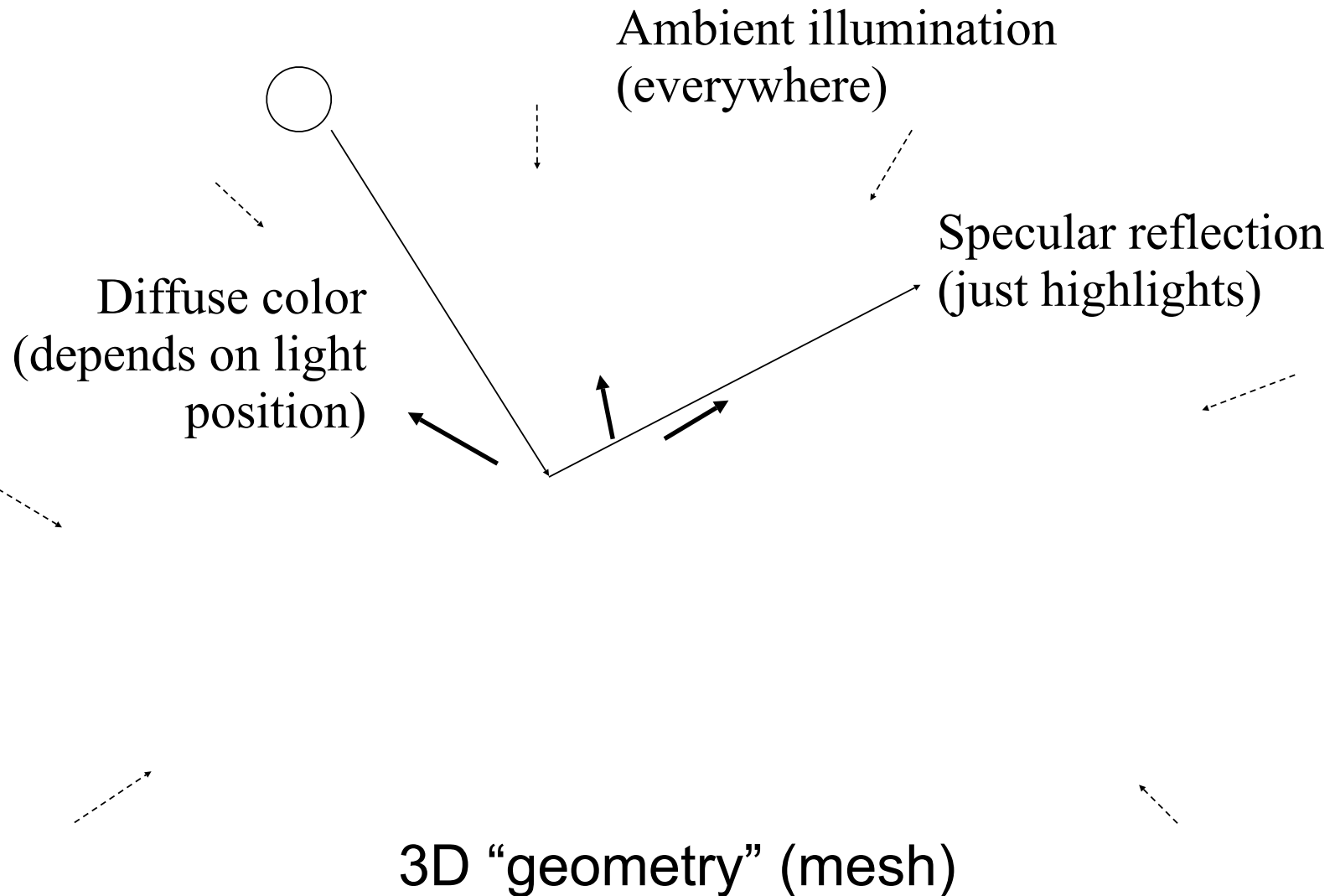
## Lecture 10: Perception III

Mar. 20, 2007

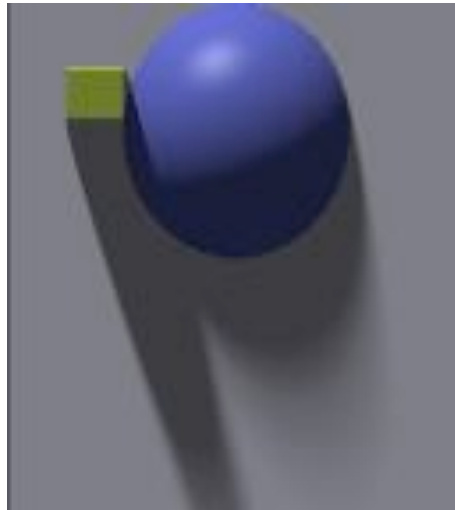
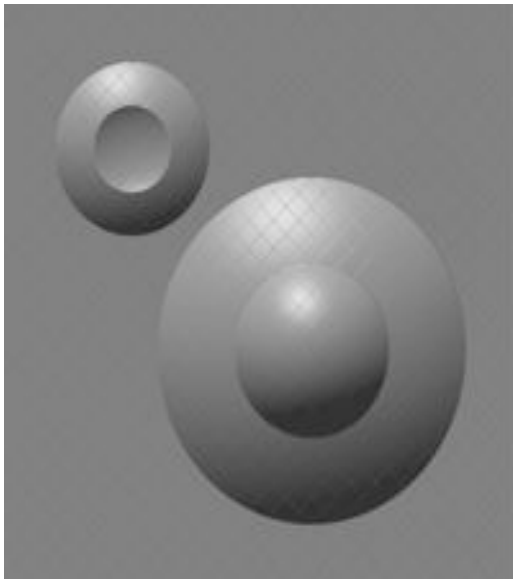
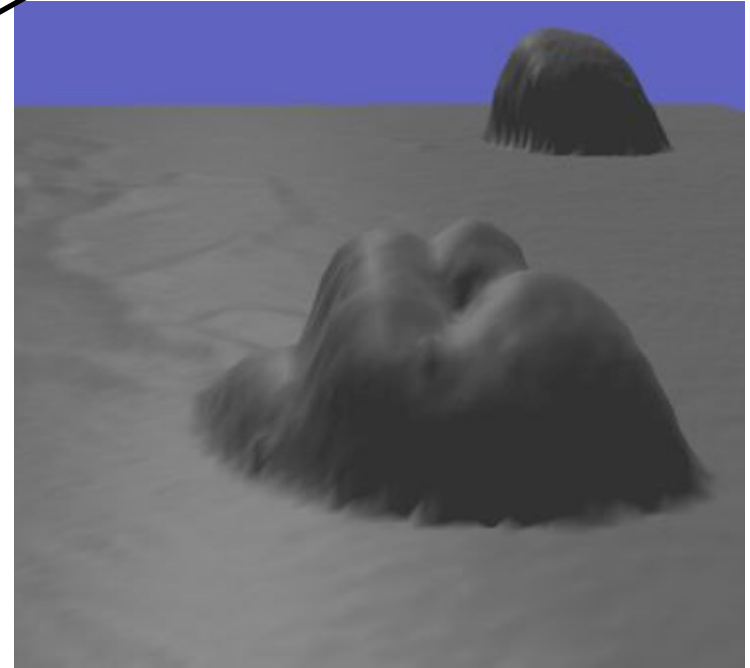
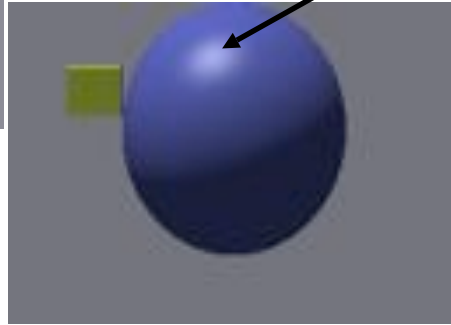
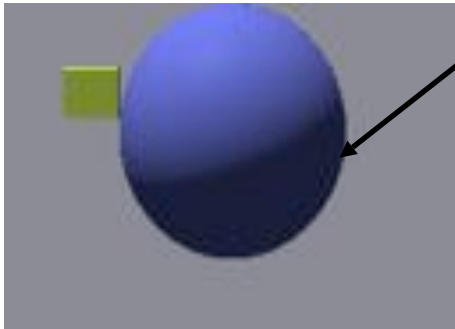
# Today

- Quick recap of pattern construction stage
- Stereo vision
- Visual Attention stage
- Housekeeping

# Recap: Computer graphics light model

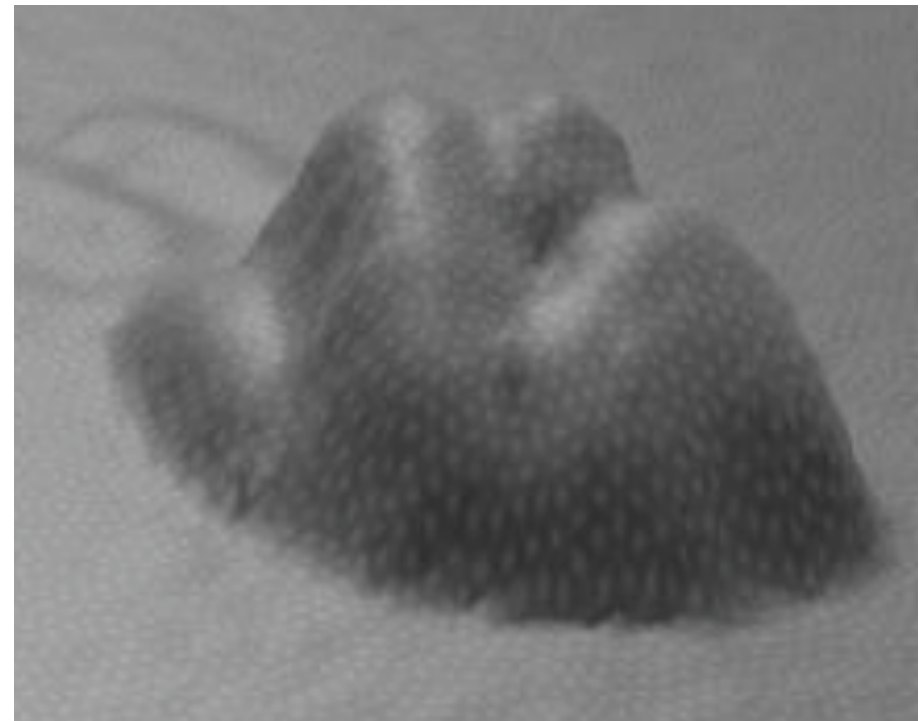
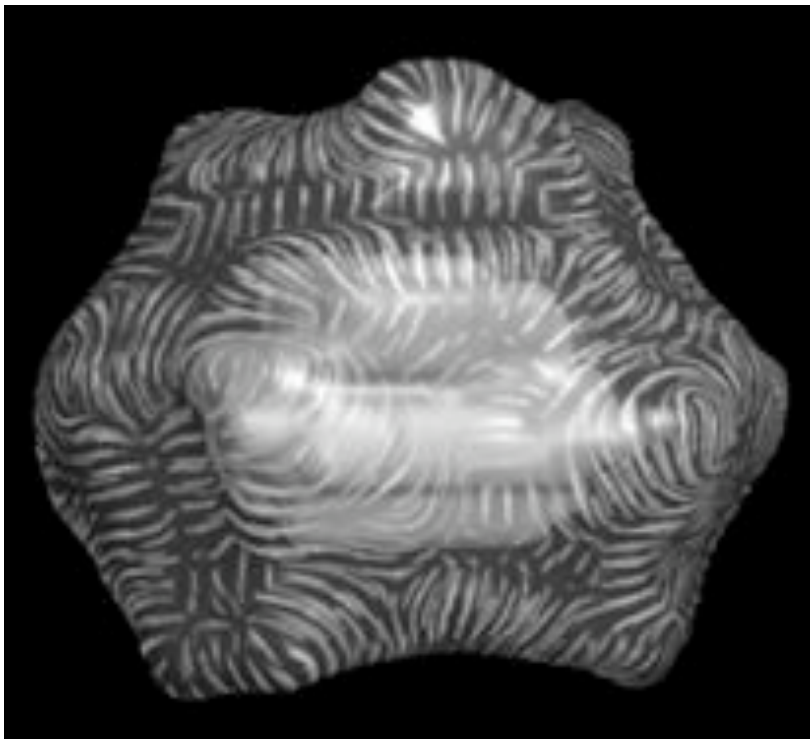
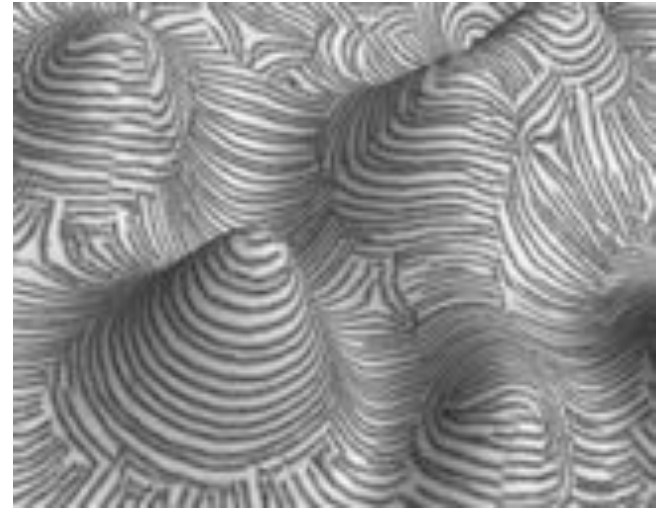
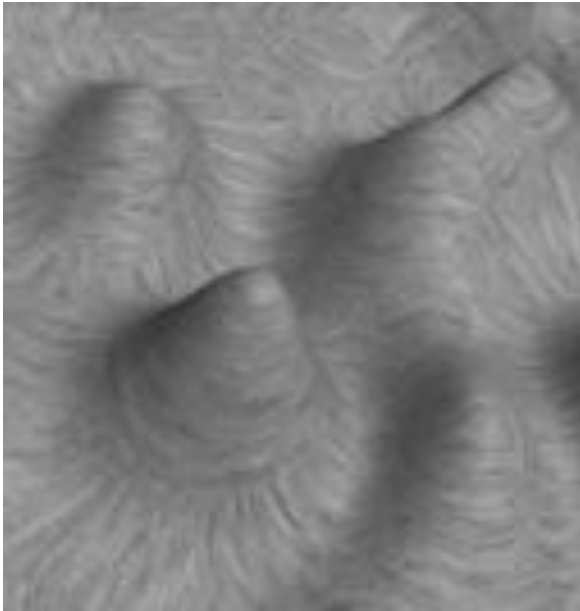


# Diffuse + specular



Shadows

# Textures

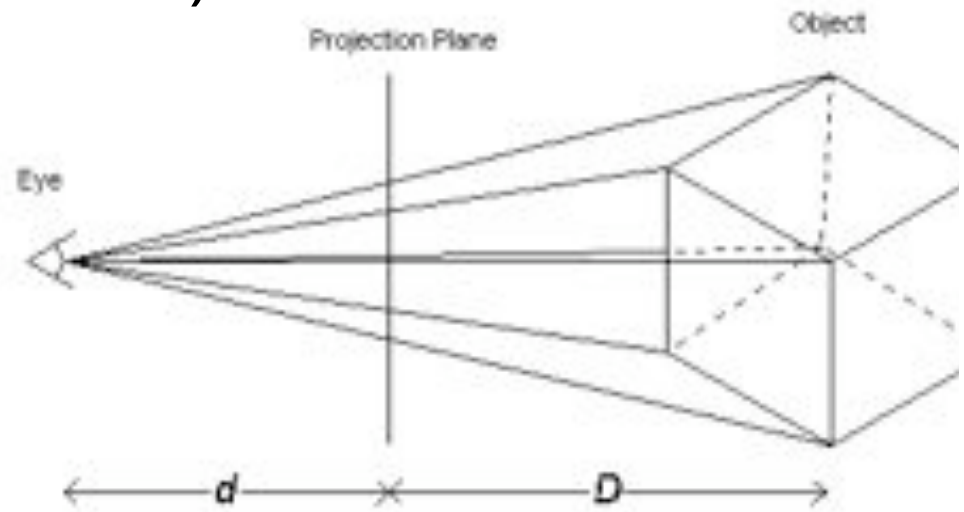


# Recap: Pattern construction stage of human vision

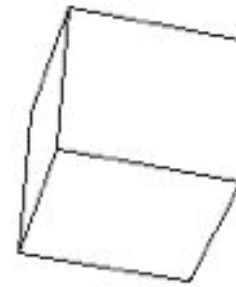
- Goals:
  - separate foreground (objects) from background
  - Reveal general object shape
  - show objects surface detail
  - Get the gist of an object with its surrounding
- Role of different light phenomena:
  - Diffuse + ambient: overall shape perception
  - Specular: show small surface details
  - Shadows: relative heights of objects, distances
  - All: Cues from changes during eye or object movement
- Perspective: depth perception (smaller, further away)
- Textures: shape cues

# Short Detour: Stereo Vision

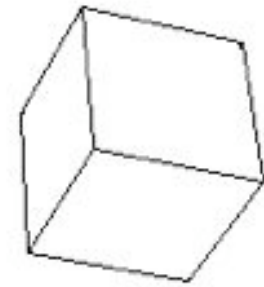
- Stereo vision vs. 3D objects
- computer graphics:
  - Camera (eye, **perspective**) looks at 3D object
  - project single image on view screen (plane)
- mono “3D” (fake stereo)
- help: movement (animation)
- stereo 3D:
- 2 human eyes
- 2 cameras



- create two images
- camera setup:
  - distance between eyes (interocular)
  - angle (to mid-plane)
  - brain fuses images together

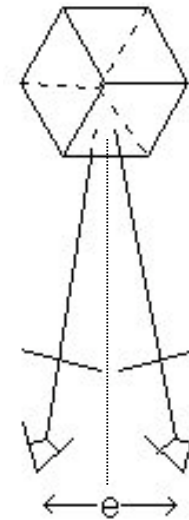


left eye

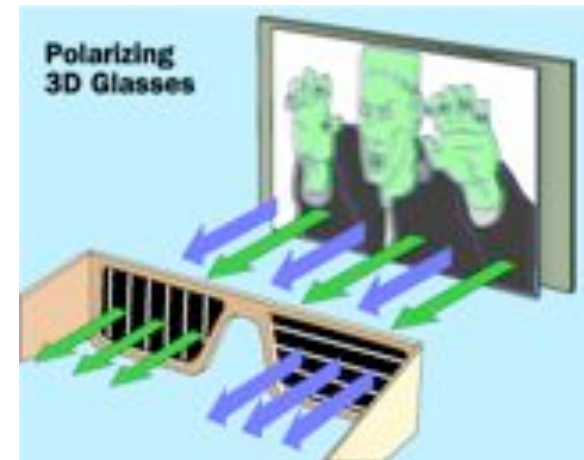
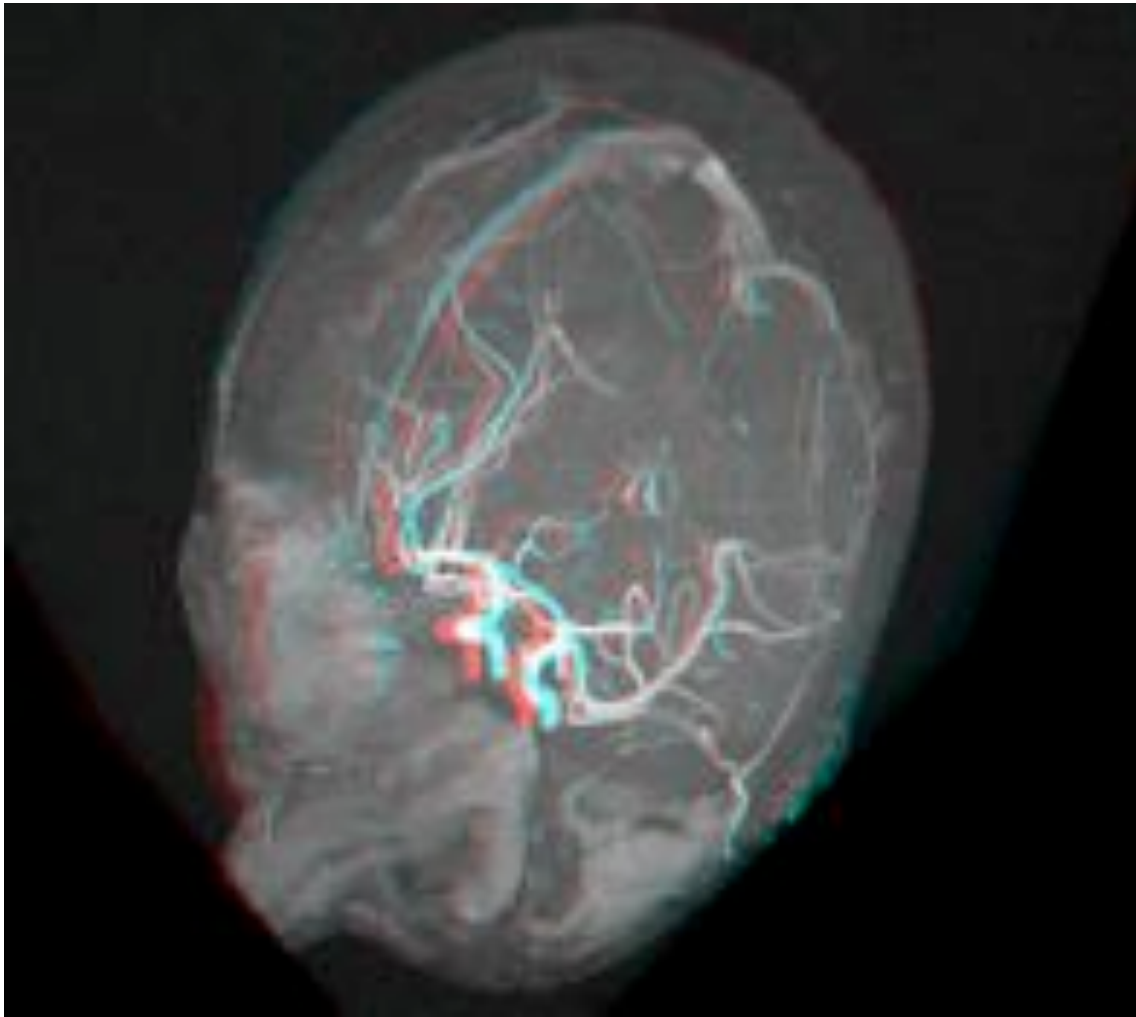


right eye

- wrong parameters: no fusion, headache
- Useful for 3D vis?
  - spatial saliency, relationship
  - more immersive, real (?)

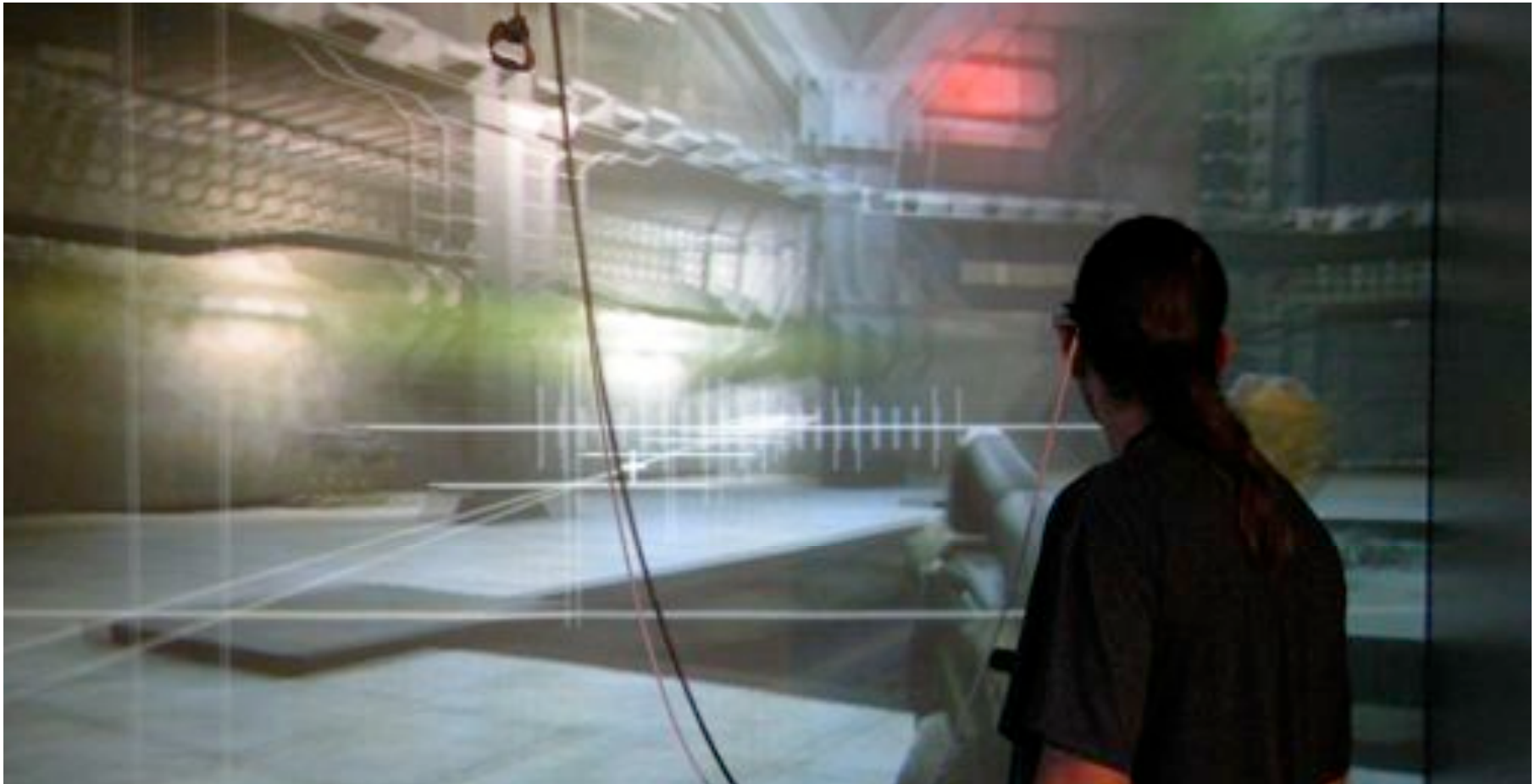


$e$  = interocular distance



Passive stereo:

- the two images always superimposed
- glasses separate images (red/blue or polarized)



Active stereo:

- 2 images are **swapped** (flickered)
- ~100 x per sec. (left-right-left-right-....)
- active LCD glasses (opaque - translucent)
- synch'ed with renderer
- effect: show left image when left eye "open"



# High level processes: Visual Attention

- Low level: produces features
- Mid level: Pattern formation, object recognition
- Problem: patterns are transitory (“fade”)
- Visual working memory is limited to a few objects (~3)
- Active attention: determines **which** patterns are analyzed
- Basis: change blindness studies (~10 years)

# Change Blindness research

- Human vision is not like photography (eyes+brain  $\neq$  cameras+film!)
- Vision does **not** create a persistent image (scene) of the world around us
- Our vision is a dynamic and ongoing construction project
- Only “Need-to-know” and “just-in time”

- Examples (same visual scene):
  - find a face in a crowd - we see faces
  - find a path through the crowd we see openings
- Visual working memory can only store a few references to previously attended objects (“pointers”)
- Pointers can be (temporarily) lost and need to be re-attended to
- Result: change blindness

- Lets experience it !
- You will see one image, then a white slide and then a “slightly different” image
- If you spot the difference between the last picture and the next, don't say anything !!!
- <http://www.usd.edu/psyc301/Rensink.htm>
- Ready ?



If you spot the difference between the last picture and the next

-

-

don't say anything !!!



Difference?





# Another Example



If you spot the difference between the last picture and the next

-

-

don't say anything !!!



So - how many **figures** did  
you see ?



- Works in real-life too:
    - <http://viscog.beckman.uiuc.edu/grafs/demos/10.html>
    - <http://viscog.beckman.uiuc.edu/grafs/demos/12.html>
  - Related: subtle change over time
    - [http://viscog.beckman.uiuc.edu/grafs/demos/\\*](http://viscog.beckman.uiuc.edu/grafs/demos/*)
- \* = 1.html - 9.html

# Change blindness: Summary

- Problem: although actual image difference are substantial, the blank slide that disrupts attention
- Not a low-level problem: failure based on inappropriate attentional guidance
- Seems to be a need to **focus** on the changing object
- In general: patterns are made or stored on demand only
- we don't retain much about the world, unless we use attention

# Consequences for 3D visualization:

- Focus depends on type of questions / queries
- Attention may be lost during navigation - need for overview vs. details
- Action creates attention: Visualizations should:
  - be highly interactive
  - Guide the user's attention
  - augment the user's abilities
- Further material on 3D Visualization & perception:  
work by: Victoria Irrante, Russ Taylor, Colin Ware,  
Ronald Rensink

- Questions?
- Upcoming lectures :
- non-visual visualization,
- python scripting for import/export (1,2)
- Lab: ch. 7 finish + ch. 8 (read ahead)
- project ?

- Quiz 3 (Perception only) March 27
- Presentations 1: March 27 (Jia, Brandon, Alex)
- Presentations 2: April 3 (Wei, Valerie, Kevin)
- Presentations 3: April 10 (Andrew, Dao, Nathan)
- Dead week: April 24: Final recap + Evaluations,  
April 26 Open DX Q&A
- Final: Tuesday, May 1, 7:45 (can we do 9:00?)